

Signal bus voltage



Overview

The CAN protocol, like many networking protocols, can be decomposed into the following : Application layer• Application-specific logicObject layer.

Key Takeaways

Signal bus voltage refers to the electrical potential levels on a communication or power bus that determine logical states and ensure proper operation of connected devices.

General Concept of Bus Voltage

A bus is a shared conductor that distributes power or signals among multiple components in a system. The bus voltage is the electrical potential measured on this conductor, which can be either DC or AC depending on the application. In digital and communication systems, the bus voltage defines logical states, while in power systems, it ensures stable energy delivery to all connected devices .

CAN Bus Voltage

In a CAN bus, differential signaling is used with two lines: CAN_H and CAN_L. Typical voltage levels are approximately 3.5V for CAN_H and 1.5V for CAN_L during a dominant state. The differential voltage ($V_{diff} = CAN_H - CAN_L$) determines the logical state:

- Dominant state: $V_{diff} > 0.9V$
- Recessive state: $V_{diff} < 0.5V$

- Undefined state: $0.5V \leq V_{diff} \leq 0.9V$ This differential approach improves resistance to electromagnetic interference (EMI) and ensures reliable communication even in electrically noisy environments .

LIN Bus Voltage

For a LIN bus, the data signal operates between 0V and V_{SUP} , where V_{SUP} is typically 7–18V. The bus uses a dominant-low protocol:

- Dominant level: below 40% of V_{SUP}
- Recessive level: above 60% of V_{SUP} The absolute maximum voltage for LIN transceivers ranges from -0.3V to 40V, ensuring safe operation across the network .

Digital Bus Switches

In high-speed digital buses, bus switches control signal propagation. The output voltage of a bus switch is influenced by the supply voltage (V_{CC}) and the transistor threshold voltage (V_{TH}). For example, with $V_{CC} = 5V$, the output follows the input up to about 4V, after which it clamps to $V_{CC} - V_{TH}$. This ensures proper voltage levels while minimizing noise and power dissipation .

Summary

- Bus voltage is critical for both power distribution and signal integrity.
- CAN bus uses differential voltages (1.5–3.5V) to define dominant and recessive states.
- LIN bus operates relative to V_{SUP} (7–18V) with dominant-low signaling.
- Digital bus switches maintain voltage levels while enabling fast, low-noise signal propagation. Understanding these voltage levels is essential for designing reliable communication networks and ensuring proper operation of all connected devices.

Article Content

Automotive Communication Networks, Part II CAN Bus

The CAN transceiver converts the binary data into a voltage range and this is the signal voltage observed on the network. Note:

Related Video Reference

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